# Sorption of Fuel Gas Odorants on Clay Surfaces by Gas Chromatography

K.E. Miller [S]
*Physical and Chemical Properties Division, Chemical Science and Technology Laboratory, National Institute of Standards and Technology, Boulder, CO, U.S.A.*

T.J. Bruno [C]
*Chemical Science and Technology Laboratory Physical and Chemical Properties Division, National Institute of Standards and Technology, Boulder, CO, U.S.A.*

Sulfur compounds are added in concentrations of approximately 4 ppm (by mass) in fuel gases [natural gas and liquefied petroleum gas (LPG)] to make the gases detectable in the event of fuel leaks. Over time, however, the concentrations of these added odorants decrease below olfactory thresholds. This is known as odorant fading, and occurs through various mechanisms. When leaks occur in transfer and service lines, sorption processes between the odorants and the soil result in diminished odorant concentration. This can result in the accumulation of explosive quantities of gas that remain undetected. The metrology for determining heats of adsorption and interaction for nine fuel gas odorants on clay and organo-clay substrates is presented. These data represent a significant step in quantifying and understanding contributions of sorption interactions between odorants and natural soils. The measurements are made using wall coated open tubular (WCOT) column gas chromatography. Clay stationary phases for the WCOT column are created using the synthetic clay Laponite-RD. The clay stationary phases are subsequently coated with octadecane to create an organo-clay stationary phase. Experimental results show that, as a class, the sulfide odorants have larger adsorption enthalpies on clay and organo-clay surfaces than the thiol odorants. Therefore, thiols are less likely to be sequestered on soil surfaces. Further, we demonstrate how Lewis acid-base chemistry on clay surfaces and humidity contribute to enthalpy differences between the sulfide and thiol classes. In addition, the difference in enthalpy between the fuel gases and their respective odorants on both substrates are presented.